# Policy for Science, Technology, & Innovation in the Obama Administration: A Mid-Course Update

#### John P. Holdren

Assistant to the President for Science and Technology
Director, Office of Science and Technology Policy
Co-Chair, President's Council of Advisors on Science and Technology



### Plenary Lecture 2011 Annual Meeting of the AAAS

Washington DC • 18 February 2011



"Science is more essential for our prosperity, our security, our health, our environment, and our quality of life than it has ever been before."

- President Barack Obama, April 27, 2009

#### **Challenges linked to ST&I: Domestic**

- <u>economic recovery & growth</u>: S&T as drivers (infotech, biotech, nanotech, greentech...?)
- health care: better outcomes for all at lower cost
- energy & climate: cleaner, safer energy supply (incl reduced oil imports & GHG emissions)
- other resources & environment: water, land use, coastal zones, toxics, biodiversity, sustainability
- national & homeland security: IED detection & disarming, cyber- & power-grid security, biodefense, ensuring safety/reliability of shrinking US nuclear stockpile without nuclear testing

#### Challenges linked to ST&I: Global

- <u>Health</u>: Defeating preventable and pandemic disease
- <u>Development</u>: Eradicating poverty and providing the possibility of sustainable prosperity for all
- <u>Energy-Climate</u>: Providing for societies everywhere the energy their economies need without wrecking the climate their environments need
- <u>Land-Water</u>: Managing the intensifying competition for the world's land & fresh water among food, fiber, fuel, infrastructure/industry, and ecosystem function
- Oceans: Maintaining their ecological integrity & productivity
- WMD: Avoiding use of nuclear and biological weapons

#### **President Obama's views on the challenges**

- They're interdisciplinary and interconnected (I&I)
- S&T are not just germane to success but central.
- Centrality means putting S&T in the center of what the federal government thinks, says, and does about these challenges – "Science in its rightful place."
- Success requires not only applying S&T to specific challenges but also nurturing the cross-cutting foundations of strength in S&T.
- I&I mean solutions require partnerships across: federal agencies; branches & levels of government; public, private, & philanthropic sectors; and nations.

#### The centrality of S&T: What do we need?

- <u>The Economy</u>: innovation that yields better manufacturing techniques, better products & services, and (thus) high-quality, sustainable jobs...
- <u>Health</u>: new IT tools for medical records, doctor-doctor & doctor-patient interaction; better, cheaper diagnostics; faster vaccine development & production; cancer therapies that target only cancer cells...
- <u>Energy</u>: better batteries, cheaper photovoltaic cells, lower-impact biofuels, CO<sub>2</sub> capture & sequestration, safer nuclear fuel cycles, fusion...

#### What we need from S&T (continued)

- <u>Agriculture</u>: stress-tolerant crop varieties, livestock resistance to disease, farmer access to knowledge & markets through IT
- <u>Climate Change</u>: better monitoring in-situ & from space; better models on faster computers; regional disaggregation of impacts to support adaptation; better scientific communication for public understanding...
- National & Homeland Security: better detection of conventional & nuclear explosives and of clandestine weapons facilities; faster identification of & response to bio-threats; better defenses against cyber-threats...

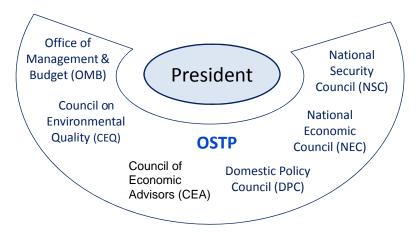
#### **Cross-cutting foundations of strength in S&T**

- the institutions that do most basic research
  - research universities, national labs, nonprofits
- other key infrastructure
  - IT/broadband, high-speed computing, energy, transportation, space technology
- science, technology, engineering, & math (STEM) education
- economic & policy conditions conducive to entrepreneurship, innovation, partnerships
  - IPR, financing, tax policy, export policy, immigration policy, transparency & predictability in regulation

#### The federal support infrastructure for ST&I

- Congress
  - S&T authorizing & appropriations committees
- S&T-rich cabinet departments & their agencies
  - Defense (with DARPA), HHS (w NIH, FDA, CDC),
     Energy (w ARPA-E), Commerce (w NOAA, NIST),
     Interior (w USGS), Agriculture (w NIFA), State/OES
- Free-standing S&T-rich agencies
  - NSF, NASA, EPA, FCC, SBA

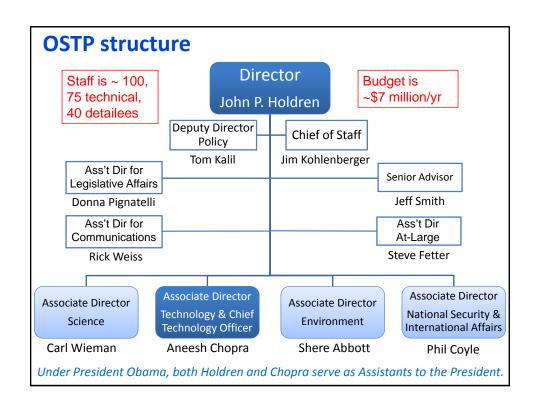
### Federal support infrastructure for ST&I (continued): The Executive Office of the President



EOP also includes Offices of: Vice President, Chief of Staff, Cabinet Affairs, Communications, Intergovernmental Relations, Public Engagement, Legal Counsel, US Trade Representative, Energy & Climate Change, and more.

#### Responsibilities of OSTP and the S&T Advisor

- Policy for science and technology
  - Analysis, recommendations, & coordination with other White House offices on R&D budgets & related policies, S&T education and workforce issues, interagency S&T initiatives, broadband, open government, scientific integrity...
- Science and technology for policy
  - Independent advice for the President about S&T germane to all policy issues with which he is concerned



#### **OSTP-managed entities**

- National Science & Technology Council (NSTC)
  - Deputy secretaries & undersecretaries of cabinet departments with S&T missions, plus heads of NSF, NIH, NASA, NOAA, NIST, EPA, USGS, CDC
  - Nominally chaired by the President; chaired in practice by the OSTP Director / Science Advisor; administered by OSTP
  - Coordinates S&T activities that cross agency boundaries
- President's Council of Advisors on Science and Technology (PCAST)
  - Co-Chairs J Holdren & E Lander
  - Vice-Chairs W Press & M Savitz
  - 16 other members from academia, industry, NGOs
  - Helps link White House to wider ST&I community

# Putting science "in its rightful place": Presidential appointments

- Five Nobel Laureates in science
  - Energy Secretary Chu, OSTP Associate Director for Science Wieman, NCI Director Varmus, PCAST Members Molina and Zewail
- Another 25+ members of the NAS, NAE, IOM, and American Academy of Arts & Sciences
  - Including heads of NIH, NOAA, USGS, FDA, NIFA
- A CTO (Chopra) and a CIO (Kundra) in the White House for the first time
- An engineer running EPA (Lisa Jackson)

ST&I have never been so prominent in leadership positions.



President Obama with his PCAST, NAS Board Room, 4-27-09

#### "Rightful place": speeches & events

Highlighting ST&I in...

- Speeches throughout the campaign, then Inaugural Address and speeches at: 2009 annual meeting of the NAS, Cairo Egypt, Albany NY, MIT, State of the Union (2010, 2011), Kennedy Space Center, Marquette MI, Portland OR (today!)
- White House events with nat'l middle-school and highschool science & math winners, National Medal of Science and National Medals of Technology & Innovation winners, groups of US astronauts (on 7 occasions), US Nobel Prize winners, math & science teaching & mentoring award winners, PECASE winners.

No president has ever talked as much about ST&I.

#### With middle-school "Mathletes" in the Oval Office



#### "Rightful place": PCAST studies undertaken

- PCAST studies requested and completed:
  - The science and technology of 2009-H1N1 Influenza
  - Reengineering the Influenza Vaccine Production Enterprise
  - Assessment of the National Nanotechnology Initiative
  - Prepare and Inspire: K-12 STEM Education
  - Accelerating the Pace of Change in Energy Technologies
  - Realizing the Full Potential of Health IT to Improve Healthcare
  - Designing a Digital Future: Networking and IT R&D
- PCAST studies underway (with more to come):
  - Advanced manufacturing
  - Biodiversity preservation and ecosystem sustainability
  - The science of carbon offsets
  - STEM Higher Education the first two years

No President has asked PCAST to do so much so soon.

#### The President and his PCAST



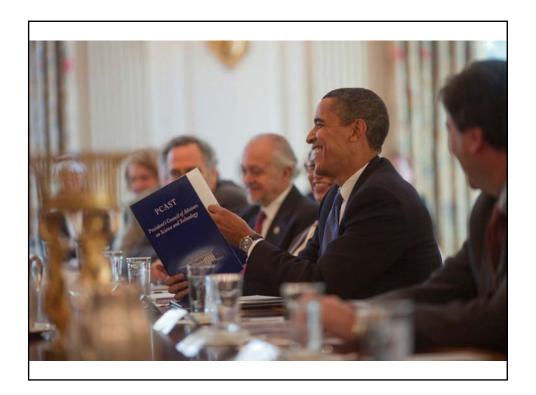
President Obama, VP Biden, and PCAST in the East Wing, 11-04-10

#### "Rightful place": PCAST studies implemented

PCAST recommendations that are part of the President's 2012 strategy:

- Prepare an additional 100,000 K-12 STEM teachers by the end of the decade
- Launch a new Advanced Research Projects Agency Education (ARPA-ED)
- Initiate improvements to influenza vaccine manufacturing to shorten production timeframe
- Accelerate breakthroughs in advanced manufacturing technologies
- Expand funding for Advanced Research Projects Agency Energy (ARPA-E) and three new Energy Innovation Hubs
- Accelerate adoption of Electronic Health Records, and develop standards for health information exchange over the internet
- Support research to foster the next revolution in IT, to help transform healthcare, energy efficiency, education, and transportation

This PCAST works for a President who is listening!



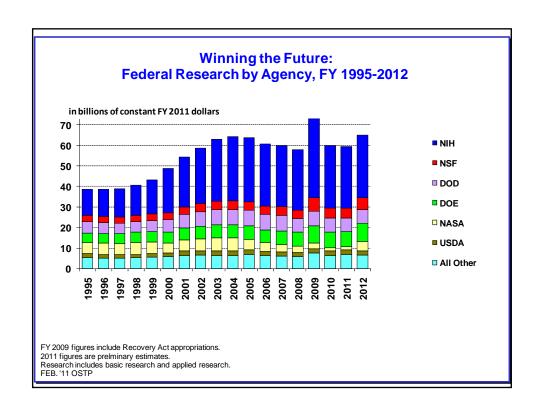
#### "Rightful place": budgets

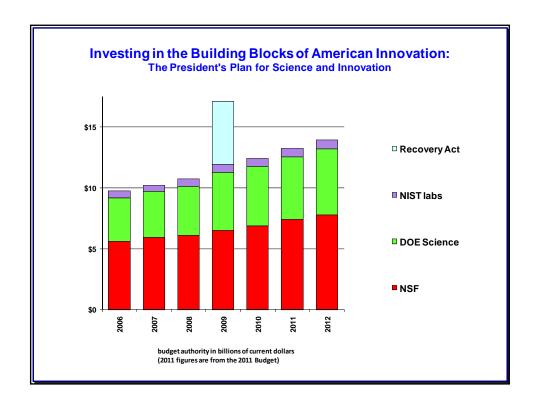
#### Investments in S&T

- Science got a huge boost in the stimulus/recovery package (American Recovery & Reinvestment Act --ARRA) and the FY2009 / FY2010 budgets, giving 2009-10 the highest federal research spending ever.
- Total ARRA funds for S&T, including IT & transportation infrastructure, applied energy technology, space exploration, exceeded \$100 billion.
- Investment goals announced in 2009: double budgets of basic science agencies in 10 yr; make Research & Experimentation Tax Credit permanent: lift public + private investment in R&D to ≥ 3% of GDP.

#### The President's FY2012 R&D Budget

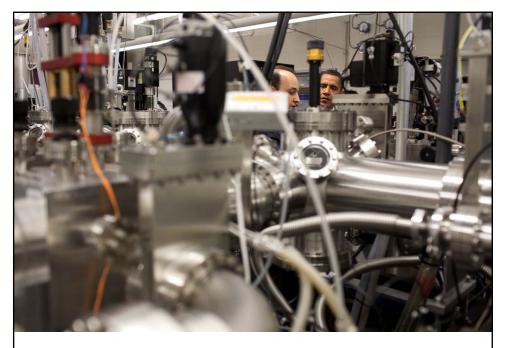
- \$147.9B for Federal R&D—up \$0.8B from FY2010 enacted
- Nondefense R&D = \$66.8B—up \$4.1B (6.5 percent)
- Basic & applied research = \$66.1B—up \$6.9 billion (11 percent)
- NIH—\$31.8B (up 2.4 percent)
- DOE total—\$13.0B (up 20 percent)
  - DOE's Office of Science—\$5.4B (up 10.7 percent)
- NASA—\$9.8B (up 6 percent)
- NOAA—\$5.5B (up 15.8 percent)
- DHS—\$1.05B (up 19 percent)
- National Science Foundation—\$7.8B (up 13 percent)
- NIST—\$764M (up 15.1 percent)
- Defense Department's R&D portfolio—\$76.6B (-4.9 percent)





#### Initiatives: energy & environment 2009-10

- \$80 billion for clean & efficient energy in ARRA
- creation of ARPA-E (\$400M in 2009-10, \$300M proposed for FY2011), 3 energy-innovation hubs
- first-ever fuel-economy/CO<sub>2</sub> tailpipe standards
- US Global Change Research Program revived, with \$2.56 billion proposed for FY2011 (19.4% real increase).
- Interagency task force led by OSTP, CEQ, NOAA on coordination of government's adaptation activities
- Expanded responsibilities for the renamed NSTC Committee on Environment, Natural Resources, and Sustainability
- New National Oceans Policy & National Oceans Council



The President at the MIT Energy Lab, October 2009

#### Initiatives: energy & env't 2009-10 (continued)

- OMB/OSTP budget letter to agencies (7-21-10)
  - Calls for priority on understanding, mitigating, & adapting to climate change, and for support for the new National Climate Assessment covering these bases.
- Executive Order on Federal Leadership in Environmental, Energy, & Economic Performance (10-09)
  - "to establish an integrated strategy towards sustainability in the Federal Government and to make reduction of greenhouse gas emissions a priority..."
  - designation of agency senior sustainability officers
  - sustainable buildings & acquisition policies
  - targets for GHG reductions in Federal agencies (28% reduction by 2020)



Sustainability "on the ground": the First Couple planting trees in a DC wetland.

#### Initiatives: energy & env't 2011

- FY2012 Budget has \$550M for ARPA-E; EERE up 43%; energy hubs doubled 3→6
- Making climate change mitigation & adaptation a priority for initiatives in departments & agencies, employing existing authorities.
- Working with the new Congress on initiatives for accelerating the transition to cleaner & more efficient energy options that bring multiple economic, environmental, & security benefits.
- Working with other major emitting countries to build technology cooperation + individual & joint climate policies for mitigation and adaptation.



President Obama and VP Biden with rooftop PV arrays, Denver

#### The US Global Change Research Program

- Administered by the USGCRP subcommittee of the NSTC's CENR, w 13 participating dep'ts & agencies
- We are engaged in broadening and strengthening USGCRP's work on:
  - Science: aerosols, precipitation, ice, paleoclimate, regional climate prediction
  - Adaptation: accounting for system effects, economics, behavior, governance issues
  - Integrated Assessment: engaging & meeting the needs of diverse regions, sectors, with the next National Assessment of Climate Change underway for 2013 delivery
- 2012 proposed budget = \$2.6B, up 19% real

#### **National Oceans Policy**

**Executive Order 13547, 19 July 2010** 

- The EO establishes our Nation's first ever National Policy for Stewardship of the Ocean, our Coasts, and the Great Lakes
- Creates an interagency National Ocean Council to provide sustained, high-level, and coordinated attention to advance the National Policy
- Prioritizes 9 categories for action that seek to address the most pressing challenges facing the ocean, our coasts, and the Great Lakes
- Establishes a flexible framework for effective coastal and marine spatial planning to address conservation, economic activity, user conflict, and sustainable use of ecosystem services

33

### President Obama signing the National Oceans Policy Executive Order (19 July 2010)



#### National Oceans Policy: The nine categories of action

- Four priority objectives to improve the way we do business:
  - ✓ Ecosystem-based management
  - ✓ Coastal and marine spatial planning
  - ✓ Inform decisions and improve understanding
  - ✓ Coordinate and support
- · Five areas of special focus:
  - ✓ Resiliency/adaptation to climate change and ocean acidification
  - ✓ Regional ecosystem protection and restoration
  - ✓ Water quality and sustainable practices on land
  - ✓ Changing conditions in the Arctic Ocean
  - ✓ Ocean, coastal, and Great Lakes observations and infrastructure

35 35

#### The President's American Innovation Strategy

- Invest in the building blocks of innovation
  - educate Americans with 21st century skills
  - strengthen leadership in fundamental research
  - Building a leading physical infrastructure
  - develop an advanced IT "ecosystem"
- Promote market-based innovation
  - accelerate business innovation w R&E tax credit
  - encourage innovation-based entrepreneurship
  - grow investments in ingenuity w effective IPR policy
  - promote innovative, open, competitive markets

#### The American Innovation Strategy (continued)

- Catalyze breakthroughs for national priorities
  - unleash a clean-energy revolution
  - accelerate biotech, nanotech, & advanced mfg
  - develop breakthroughs in space applications
  - drive breakthroughs in health-care technology
  - create a leap forward in educational technologies
- These efforts include increased support for...
  - scientists & engineers early in their careers
  - commercializing university research
  - multidisciplinary & high-risk/high-return research

#### **STEM-education initiatives**

- Increased collaboration of White House (OSTP, DPC) with Dept of Education & NSF, HHS, DoD, DOE, NASA
- New national goals: moving American kids from middle to top of international rankings on science & math tests, increasing American proportion of college graduates to first in the world by 2020.
- \$4.4 billion "Race to the Top" in the ARRA included preference to states whose proposals emphasize innovation in STEM education.
- "Educate to Innovate" program (11-09) for K-12 STEM education w \$700+ million in private-sector & philanthropic support; "Change the Equation" added 9-10

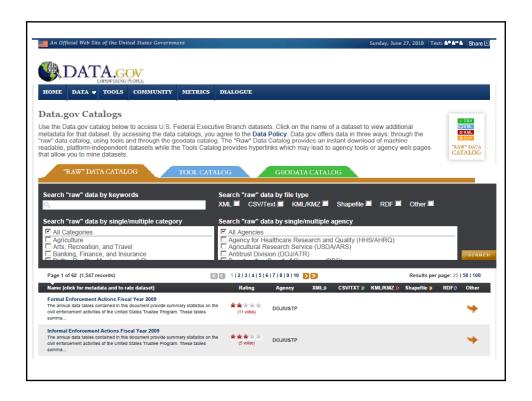


The White House Science Fair, 18 October 2010

#### **Initiatives on principles & procedures**

- Stem-cell guidelines
  - expanding stem-cell lines that can be used with federal support while respecting ethical boundaries
- Reporting procedures for Federal grants
  - streamlined and made consistent across agencies
- Scientific integrity principles
  - Presidential memo 3-09, add'l guidelines 12-10
  - ensuring openness, transparency, reliance on peerreviewed science across Federal agencies
- Open government
  - expanded access to databases at every agency





#### **Initiatives: NASA**

- The Obama Administration inherited a space program in disarray after years of mismatch of resources and vision.
- The Augustine Committee deemed the Constellation program for crewed missions beyond low Earth orbit (LEO) "unexecutable".
- Meanwhile Earth science, space science, & aeronautics had been gutted to feed Constellation; the ISS was going to be scrapped in 2016; and the projected gap in ability to transport US astronauts to LEO on US rockets after Shuttle retirement was lengthening.
- The new Administration developed a plan to rebalance NASA's programs, with longer use of the ISS, more science, more R&D on advanced systems, more diverse destinations for crewed missions, and increased reliance on commercial transport of crew to LEO.
- The new plan was rolled out with the President's FY2011 Budget and elaborated in a speech by the President at KSC on 4-15-10.



#### NASA (continued)

- The NASA Authorization Act of 2010 represented a compromise containing much that the President and NASA leadership wanted but reflecting a Congressional preference for using existing technologies and contracts to develop a replacement for Constellation's "heavy lift" rocket by the end of 2016.
- The FY 2012 budget funds every element of the 2010 Act, but there will be arguments about the numbers proposed, some rooted in challenges arising from the lack of a 2011 budget.
- Omens for success of "commercial crew" have been improving, including 2 recent successful launches of the SpaceX company's Falcon 9 rocket (the 2<sup>nd</sup> one with orbit and on-target splashdown of a dummy crew capsule), and the entry of a Constellation prime contractor into the commercialcrew competition.

#### Partnerships: working w the private sector

- Firms fund 67% of US R&D, perform 72%.
- Pres Obama has proposed to make the Research
   & Experimentation tax credit permanent.
- Recovery Act has helped start & grow cleanenergy businesses across the country.
- Small Business Innovation Research (SBIR)
  initiative provides funding from diverse agencies
  for many avenues of innovation.
- Small business lending bill (signed 9-27-10) increases loans & cuts taxes for entrepreneurs.
- DOE's energy-innovation hubs link national labs, universities, and industry.



President visiting GE Schenectady, 21 January 2011

#### Partnerships with the private sector (continued)

- Launched Jan. 31, Startup America is facilitating entrepreneurship by increasing the success of high-growth startups that create broad economic growth and quality jobs
  - Aims to accelerate the transfer of new ideas from labs to the market
  - Create new opportunities for small business financing
  - Improve regulatory environment for starting and growing new businesses
- 15 private-sector leaders have committed to Startup America's goal of catalyzing & developing entrepreneurial ecosystems across the Nation
- Last week the President visited Northern Michigan University to unveil the Wireless Innovation and Infrastructure Initiative (Wi3), an ambitious blueprint to connect 98 percent of the US population with 4G wireless
  - "To attract the best jobs and newest industries, we've got to out-innovate, out-educate, out-build and out-hustle the rest of the world." - President Obama at NMU

## Harnessing private innovation: prizes and challenges

- Prizes & challenges harness the ingenuity that lurks in individuals, schools, firms all across the society.
- Sponsors/organizers set an ambitious goal without prescribing the best means to achieve it, pay only for results.
- The Administration's new <u>challenge.gov</u> website provides 1-stop shopping for innovators looking for opportunities.

#### Prizes and challenges (continued)

- The recent Progressive Insurance / DOE
   Automotive X-Prize illustrates the leverage in this approach.
  - \$10M in prizes for super-fuel-efficient passenger vehicles (over 100 miles per gallon of gasoline equivalent) called forth \$100M+ in investments in innovation by competitors.
  - Winning designs achieved up to 200 MPGe.



#### Partnerships: International ST&I cooperation

- Reviving & strengthening the high-level Joint Commission Meetings on S&T cooperation with China, India, Brazil, Japan, S Korea, Russia
- Nurturing the strong S&T cooperation that has long existed with the EU, Canada, Australia, NZ...
- Convening the Multilateral Economic Forum, US-China S&ED, US-Russia Presidential Commission strong ST&I focus
- Streamlining the visa procedures that apply to visiting scientists & technologists
- S&T as a centerpiece of Cairo speech (Science Envoys, centers of excellence) & USAID strategy

#### Science Envoys: the 1st two cohorts

2009-10

**Bruce Alberts** Indonesia, Pakistan to come



Elias Zerhouni Morocco, Libya, Algeria, Tunisia, Qatar, Kuwait, Saudi Arabia







2011-12



**Rita Colwell** Bangladesh, Malaysia, Vietnam

Gebisa Ejeta

South Africa,

Tanzania,

Kenva

Ethiopia or



**Alice Gast** Azerbaijan, Kazakhstan, Uzbekistan or Georgia

http://www.america.gov/science\_envoys.html

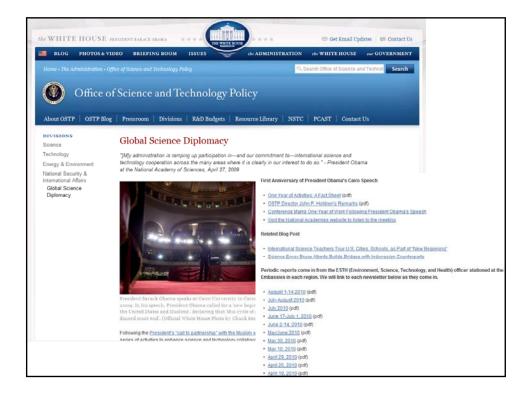
#### Priorities identified in the 1st round of envoy visits

- Global S&T knowledge-sharing initiative
  - Expand broadband access
  - Electronic libraries
  - Global e-Learning resources for students and teachers
  - Tools for mentoring and collaboration
- Enhance USG coordination, awareness
- Promote academic exchange and sustain collaborations
- Promote centers/networks of excellence

OSTP will sponsor a conference at NAS in spring 2011 on ways to enhance international S&T engagement.

#### Ongoing expansion of global engagement

- Centers of Excellence being developed in water, climate change, energy
- OSTP and NSC leading a "Global Engagement" policy committee
- State Department allocated 12 new science-officer positions in regional embassies
- New NSTC Subcommittee on International S&T



# The linchpin of progress in S&T policy: a committed President







